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IS 12568 (1988): Methods for testing black and white photographic enlargers [MED 32: Photographic Equipment]

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Indian Standard

METHODS FOR TESTING BLACK AND WHITE PHOTOGRAPHIC ENLARGERS

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NEW DELHI 110002

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Indian Standard

METHODS FOR TESTING BLACK AND WHITE PHOTOGRAPHIC ENLARGERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 20 December 1988, after the draft finalized by the Photographic Equipment Sectional Committee had been approved by the Consumer Products and Medical Instruments Division Council.

0.2 This standard describes the methods for testing photographic enlargers for amateur and professional use in ordinary photographic practice. For special uses such as in photogrammetry and photoengraving, more critical tests may be required.

0.3 This standard is based on ANSI PH 3.31-1974 'Methods for testing photographic enlargers' issued by the American National Standards Institute.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard covers the methods for testing black and white photographic enlargers for amateur and professional use in ordinary photographic practice.

1.2 More critical tests may be required for at least some functions of enlargers for photogrammetry, photoengraving and other special purposes, which have not been covered in this standard.

1.3 Some characteristics of enlargers such as ease of operation, good workmanship and finish, and sturdiness cannot be subjected to specific testing. However, they are important and should not be overlooked.

2. METHODS OF TEST

2.1 Test for Uniformity of Illumination

2.1.1 Before carrying out the test for uniformity falling on the easel, the following adjustments of the equipment shall be made:

a) The enlarger shall be set for maximum magnification.

b) An empty negative carrier of the maximum size for which the enlarger is made shall be installed.

c) If a specific lens is not supplied or recommended by the manufacturer, the enlarger shall be fitted with a lens having a focal length approximately the same as the diagonal of the negative carrier. The lens shall be focussed to give a sharp image of the edges of the negative carrier.

d) Any other adjustment recommended by the manufacturer such as centering the lamp shall also be made.

e) The enlarger shall be inspected for possible interference of the safety-filter bracket or other parts with the light beam.

f) The lens diaphragm shall be set at its largest opening in the case of the lens provided with an adjustable diaphragm. If the results of the test for uniformity of illumination are not satisfactory for some applications, they may generally be improved by reducing the opening of the diaphragm until there is no vignetting of the corner rays by the lens barrel.

g) The voltage of mains supply used shall be adjusted to within 0·5 percent of the rated voltage of the enlarger. While adjusting the mains supply the voltage shall be measured at the supply socket to which the recommended power supply cord is connected.

h) The enlarging lamp used shall be according to manufacturer's specification.

2.1.2 The illumination shall be measured at the brightest point (usually the centre) and at the darkest point (usually the corners on the easel) using a footcandle meter or other photometer.

2.1.2.1 For the purposes of comparison, the illumination at the darkest point shall be calculated as a percentage of the brightest point.

2.1.2.2 If any local irregularity is apparent, and if the measuring area of the photometer permits, the gradient of illumination across the irregularity shall be measured.

2.1.2.3 Some common and convenient photometers integrate the light over an appreciable area. The illuminometer shall have sufficient photographic sensitivity and in addition, the diameter of light receiving surface is to be less than 1/15 of the diagonal of the picture and it shall be of such construction that the direction of incident light shall not give discrepancies to its indicating values. Measurement for calculating light output shall be made with an incident light photometer without cosine correction.

2.1.3 An alternative test may be used to measure the uniformity of illumination. With no negative in the carries, a sheet of photographic paper shall be exposed so that the reflection density is between 0·8 and 1·0 in the centre of the print. High-contrast paper will give the most critical test.

2.1.3.1 The print shall be processed in accordance with the manufacturer's recommended procedure.

2.1.3.2 The print may be examined visually or measured with a reflection densitometer for both the general and local uniformity. If relative illumination measurements are desired, print density can be converted to relative log exposure by relating the density difference to a D log E curve obtained from a calibrated sensitometer on that paper grade.

2.2 Light Tightness Test

2.2.1 The procedure given below shall be followed for testing the light tightness of the enlarger:

a) The enlarger shall be placed in a dark room with light coloured walls. (The smaller the room, the more critical will the test be).

b) A negative with average overall density of about 1·0 shall be inserted in the carrier and an opaque cap shall be placed on the lens.

c) The time duration for which the enlarger lamp must be lighted at normal voltage to produce the maximum fogging of sheets of sensitized material on the easel and adjacent to the easel at the same level shall be determined. This test should be carried out with the most light-sensitive material to be used on the enlarger; for example, if separation negatives or matrices are to be made, panchromatic film should be used for the test. The manufacturer's recommendations for development of the material should be followed, carrying the development to the greatest specified amount.

Darkroom safelight illumination should be turned off during this test. The test can be performed most conveniently by covering portions of the sensitized sheets for various time durations. For example, in carrying out a test for light-tightness with ordinary enlarging paper, the lamp might be on for 16 minutes, and parts of the paper would be covered with opaque cards to give exposure times of 0, 2, 4, 8 and 16 minutes.

When this test is done, it is desirable to have an unexposed area of the sensitized material adjacent to each of the exposed areas. This can be accomplished, for example, by making the exposures through holes in an opaque mask covering the sensitized sheet.

2.2.2 The enlarger shall be inspected for light leaks while it is in a darkroom.

2.3 Test for Effectiveness of Safety Filter — With the safety filter in its operating position, the time required to produced detrimental fogging of the sensitized material on the easel shall be determined. The procedure outlined in **2.2.1**(c) can be adopted for this test. The test will be most critical if the enlarger is set for minimum magnification and the diaphragm is at its largest opening.

2.4 Test for Resolution

2.4.1 The vibration of the enlarging head and enlarging easel will severely affect resolution. The test should be performed at the extremes of the magnification range provided by the enlarger, with the lens diaphragm at its largest opening, and with a test negative of the maximum size recommended for the lens under test. For some purposes, it may be desirable to perform additional tests at other diaphragm stops.

NOTE — It is assumed that a high-contrast, resolving-power-chart negative shall be used. The photographic materials used to record the resolution should be the same emulsion type as the materials used in practice. The use of glossy paper of normal grade is recommended.

2.4.2 For simple comparative purposes, it is often adequate to make the sharpest possible prints at maximum lens aperture from a negative carrying an image with fine, sharp detail.

2.4.3 For purposes requiring quantitative or numerical ratings, test prints should be made from a special test negative carrying resolution test patterns at its centre, corners and several intermediate points. When suitable, the test plate described in **5.1.1** of IS : 5673-1970* should be used.

2.5 Test for Colour Correction of Lens — If a lens has lateral colour, it will give images of slightly different magnifications for various colours of light. This can be checked easily by making a print from a negative which has a number of lines crossing and perpendicular to a diagonal of the negative, with strips of gelatin filters laid side by side across these lines on the light-source side of the negative. After the print has been developed, any discontinuity in the lines will provide a measure of the lateral colour.

2.5.1 If the lens is to be used for some process involving specific filters, the check should be made with those filters. For a more general test, it is usually satisfactory to use commercially available filters having dominant transmission at wavelengths of 650 nm (transmission of wavelengths shorter than 590 nm should be negligible) and 440 nm (370 to 510 nm).

2.6 Test for Alignment of Optical Axis, Negative and Easel

2.6.1 If there is a difference in magnification between one side of the print and the other, parallel lines in the negative are reproduced out-of-parallel in the image. This effect is called keystoning.

2.6.1.1 The only condition which can cause keystoning is that the negative is not parallel to the easel. The maximum out-of-parallel condition occurs for lines which are perpendicular to the line of intersection of the plane of the negative with the plane of the easel.

2.6.1.2 Keystoning can be detected by projecting an image on the easel from a negative having pairs of widely spaced parallel lines running in several directions. Each pair should be symmetrical with respect to the centre of the negative. If the projected lines of any pair are not parallel from one side of the image to the other, the negative is not parallel to the easel.

2.6.2 The lack of symmetry in the image resolution may be caused by any one or more of the following conditions:

a) The negative is not parallel to the easel. This asymmetry will be accompanied by keystoning.

b) The mounting surface (lens board) is not parallel to the negative and easel. If on rotating the lens and lens board together about the axis of the lens, the image resolution asymmetry does not rotate and there is no keystoning, the mounting surface for the lens board is not parallel to the negative and easel. If the image resolution asymmetry rotates with lens, the cause is one or both of the effects described in **2.6.2** (c) and **2.6.2** (d)

c) The lens is defective.

d) The flange of lens is not parallel to the mounting surface for the lens board.

2.7 Test for Temperature Rise

2.7.1 If the temperature rise of the negative is to be measured, the following conditions of measurement are recommended:

a) The ambient temperature should be about 27°C.

b) The negative should have a uniform density of $2{\cdot}0 \pm 0{\cdot}1$, and the emulsion side should be away from the lamp.

c) To simulate the operating conditions, the light source of the enlarger should be operated on an intermittent cycle of 10 seconds on and 10 seconds off.

d) The lamp should be operated at its rated voltage.

e) The temperature should be measured at the negative carrier stage by means of a thermocouple. The thermocouple shall be prepared by electrowelding to produce a beaded junction approximately 4 mm in diameter. This bead shall be flattened to form a disc of the same thickness as the diameter of the thermocouple wires, then cleaned and inspected under a microscope to ensure that the wires are not broken or damaged.

Measurement may be made to determine the maximum temperature or the time required to reach a specified temperature.

2.7.2 The temperature rise of the exterior of the lamp house can be determined by using an insulator to press a thermocouple against the points to be measured and by operating the enlarger as described in **2.7.1**.

2.8 Scratching of Negative — Although it is difficult to specify a test which will give a quantitative measurement of the scratching of the negative, it is a simple matter to insert, manipulate, and remove a fresh negative several times and then examine it for scratches. The handling should be in accordance with the manufacturer's instructions.

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*Methods of test for still projectors.